Natural Heritage & Endangered Species Program

Commonwealth of Massachusetts
Division of Fisheries & Wildlife
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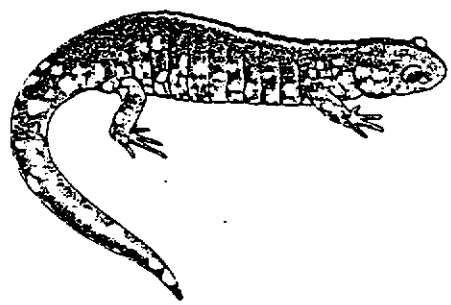
MASSACHUSETTS SPECIES OF SPECIAL CONCERN

Blue-spotted Salamander
(*Ambystoma laterale*)

DESCRIPTION: Blue-spotted Salamanders have a long, slender body, short limbs with long digits, and a narrow, rounded snout. They are characterized by dark blue to black dorsal pigmentation with a paler ventral surface, brilliant sky-blue spots or specks on the lower sides of the body, and black pigmentation surrounding the vent. The tail is long and laterally compressed, averaging 44% of total body length. During breeding season, males are identifiable by a swollen vent area caused by enlarged cloacal glands. Adults range from 9.8 to 12.7 cm (3.9 to 5.0 in.) in total length. Larvae are olive green to black and have a long dorsal fin that extends from behind the head along the back and tail.

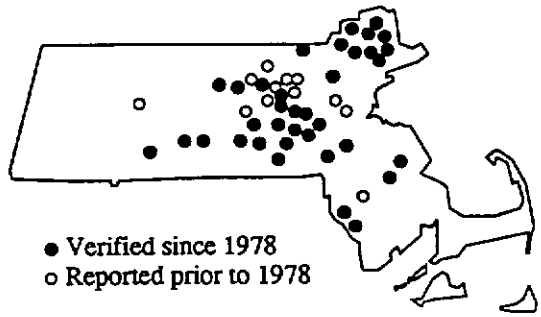


Lazell, J.D. Reptiles and Amphibians in Massachusetts. Massachusetts Audubon Society. Lincoln, MA. 1972.

SIMILAR SPECIES IN MASSACHUSETTS: The Blue-spotted Salamander is a member of the Jefferson Salamander complex. Other recognized "mole" salamander members are the Jefferson Salamander (A. jeffersonianum), the Silvery Salamander (A. platineum), and Tremblay's Salamander (A. tremblayi). The Silvery and Tremblay's Salamanders originated from hybridization between the Blue-spotted and Jefferson Salamanders. The two hybrid forms are almost always female and triploid—that is, their cells contain three complete sets of chromosomes rather than the normal two sets (diploid).

When either the Silvery or Tremblay's Salamanders are present in an area, they may outnumber the Blue-spotted or Jefferson Salamanders by a 2:1 margin. A population with many more females than males is a good indicator of the presence of Silvery or Tremblay's Salamanders. The mode of reproduction of these female hybrids is gynogenesis: sperm is obtained from male diploids to stimulate egg division, but no genetic recombination occurs. However, additional hybrid forms such as triploid males and tetraploid and diploid females have been found, indicating that some offspring retain genetic material from two parents.

Range of the Blue-spotted Salamander



Breeding Distribution in Massachusetts

The members of the complex form a continuum in appearance from the grayish-brown coloration, pale blue flecks, and wide snout of the Jefferson Salamander to the bluish-black coloration, prominent blue spots, and narrow snout of the Blue-spotted Salamander. The two main hybrid forms are best identified by chromosome counts or size of red blood cells in conjunction with their external appearance: the Silvery Salamander is almost identical to the Jefferson Salamander but is smaller, and the Tremblay's Salamander closely resembles the Blue-spotted Salamander but is somewhat larger.

RANGE: Blue-spotted Salamanders can be found discontinuously from the northern shore of the Gulf of St. Lawrence across southern Canada to Lake Winnipeg and south to New England, New York, and the northernmost parts of Ohio, Indiana, and Illinois. Disjunct colonies also exist in Labrador, Canada; Long Island; northern New Jersey; and Iowa. In Massachusetts, they occur predominantly within Middlesex and Essex counties and in the adjacent eastern towns of Worcester county. Some occurrences lie within Bristol and Plymouth counties as well. In general, Jefferson-complex salamanders found east of Worcester County's western border are likely to be either Blue-spotted Salamanders or Tremblay's Salamanders.

HABITAT IN MASSACHUSETTS: Blue-spotted Salamanders require moist, moderately shaded environments; they favor northern hardwood/hemlock forests occurring in glaciated areas having depressions available for seasonal flooding. The resulting vernal (temporary) ponds necessary for breeding and egg laying are seldom more than 30–40 cm (12–15 in.) deep. Ponds need to be full of dead and decaying leaves for cover and overhanging bushes and grass for egg deposition. Roadside drainage ditches, small kettle holes, and temporary pasture ponds also provide habitat when flooded in the spring.

LIFE CYCLE/ECOLOGY: A cryptic species, Blue-spotted Salamanders are rarely encountered above ground, except during their early spring breeding season, or as just-metamorphosed juveniles in the late summer. Adults reside most of the year beneath leaf litter or underground to a depth of one meter, usually within 500 meters of their breeding pond. The breeding season is brief, lasting from mid March to late April. As soon as the ground surface thaws, males migrate above ground to temporary ponds; females join them in a few days. An elaborate courtship of approach, contact, nudging, and tail-fanning routines takes place in the water. Females then pick up a deposited spermatophore and store it in the cloaca for egg fertilization. (Normal sexual reproduction occurs in the diploid females, while no true fertilization or recombination takes place in the triploid hybrids.) Eggs are often laid singly, with 6 to 10 eggs per mass, for a total clutch ranging from 82 to 489 eggs. The egg masses cling lightly to overhanging vegetation or fall to the bottom of the pond. Hatching about a month later, larvae are voracious eaters, preying on insect larvae and other small aquatic animals. No overwintering of larvae has been reported in Massachusetts, so by late August larvae have metamorphosed completely into air-breathing adults.

Adult Blue-spotted Salamanders feed on small invertebrates such as larval and adult insects, spiders, worms, and centipedes. They produce noxious skin secretions from specialized poison glands and are thus rarely preyed upon by native predators. If Blue-spotted Salamanders reach adulthood and their habitat is secure, they may live for decades. Except when breeding, adults probably move around within territories of less than one square meter.

POPULATION STATUS IN MASSACHUSETTS: The Blue-spotted Salamander (including triploid and other polyploid forms within the A. laterale/A. jeffersonianum complex) is currently listed as a "Species of Special Concern" in Massachusetts. Ninety-nine current populations (1978 to the present) have been documented, as well as 22 historical populations (prior to 1978). The major threat to this species—and most salamanders in general—is the loss of wetland habitat to draining, development, and other causes. For example, making temporary ponds deeper and permanent results in fish populations which predate amphibian eggs and larvae. Some population declines may also be attributed to sample overcollection, foot and road traffic, and pesticides or other toxic chemicals. Studies on the effects of acid rain on salamander eggs and larvae have been contradictory, and further studies must be made to resolve this issue, however, it appears that Blue-spotted Salamanders from eastern Massachusetts are highly tolerant of acid conditions and can hatch successfully down to a pH of 4.0.

MANAGEMENT RECOMMENDATIONS: In order to ensure the survival of this species in Massachusetts, the following recommendations regarding habitat preservation are suggested. There are two critical components in the life history of this species: the vernal pool habitat required for reproduction, and the upland forest habitat required for foraging, hibernation, and other terrestrial and fossorial activities. Conservation of the Blue-spotted Salamander—and all native members of the genus Ambystoma—must therefore focus on the preservation of vernal pools and small ponds known to be inhabited by this species, as well as a significant parcel (250–1600 meter radius) of upland habitat surrounding such breeding sites. Provided these habitats are not significantly degraded—and that the salamanders are not subject to illegal collection or high road mortality—the salamander populations should be capable of maintaining themselves indefinitely.

It should be kept in mind, however, that every population is unique. The majority of the population, for instance, may be concentrated in a relatively small and discrete upland habitat, which would safely allow carefully conducted development within some portions of the "uninhabited" habitat around the breeding pool without serious effects on the population. The only way to determine if such a case exists, however, is through a detailed environmental study conducted by a qualified researcher(s) over a series of years, charting the movements of the animals to and from the breeding site. Unless such a study is conducted, it should be assumed that the salamanders are relatively evenly distributed around the pool and development should be strongly discouraged within a minimum radius of 500–1,000 meters surrounding the breeding pool.

Vernal pools and breeding ponds must be protected not only from draining, filling, and development, but also from degradation in the form of road and lawn run-off. If lumbering is conducted within surrounding areas, a no-cut buffer zone of 50–100 feet should be established around the pool depression, and no slash or other debris should be dumped in the depression. While vernal pools receive some protection under the Massachusetts Wetlands Protection Act, and several vernal pool species (including the Blue-spotted Salamander) are protected under the Massachusetts Endangered Species Act, efforts should be made to register all vernal pools and to enhance and promote the enforcement of the laws mentioned above. Because of their ephemeral nature, vernal pools are often difficult to locate during dry periods and may be inadvertently damaged if their locations are not surveyed and marked prior to lumbering or construction operations.

Citizens must be encouraged to recognize and report Blue-spotted Salamanders and the locations of their breeding pools. Due to the rarity of this species, its ephemeral terrestrial occurrence, and its very specific habitat requirements, some populations undoubtedly remain undiscovered and therefore underprotected. Interested citizens with access to vernal pools should also be encouraged to monitor the annual production of their local salamander populations, as such data may prove invaluable in detecting population trends as well as catastrophic changes. Finally, citizens and landowners should be made aware that breeding pools degraded through pollution, drainage, or filling can often be restored to some extent, and that the possibility of reintroducing native species to such habitats should be investigated.

1994

NOTE: Vernal pools that are certified by the Natural Heritage and Endangered Species Program (NHESP) may be protected by the Massachusetts Wetlands Protection Act. If you would like more information about vernal pool certification, contact NHESP to obtain copies of the documents entitled "Guidelines for Certification of Vernal Pool Habitat," along with "Vernal Pool Field Observation Forms."

Vernal pools constitute a unique and increasingly vulnerable type of wetland that is inhabited by many species of wildlife, some of which are ENTIRELY dependent on vernal pool habitat for one or more stages of their life cycle. Two-thirds of the Commonwealth's rare amphibians (4 of the 6 species) are totally dependent upon vernal pools for breeding.

(continued overleaf)

SUGGESTED GUIDELINES FOR TIMBER HARVESTING NEAR VERNAL POOLS

Vernal pools provide critically important habitat for a number of rare and endangered species in Massachusetts. Certain precautions should be taken when harvesting in the vicinity of such pools to minimize impacts and preserve the character and physical environment that these species require. Although these pools may only actually be filled with water for a brief period of time in the spring, the most important measure that can be taken to protect the habitat is to recognize pool locations even in the "dry" season and take precautions to preserve the local environment around the pools. Recognizing these seasonal pools and considering the following guidelines will help protect these critical habitats:

1. Heavy equipment should not be permitted in vernal pool depressions at any time of the year. Avoid locating landings, skid roads, or haul roads through or near these depressions. It is important that the depressions not fill in with sediment from nearby areas of disturbed soil.

2. Similarly, do not stack logs or otherwise create soil compaction in vernal pool depressions.

3. Avoid operating logging machinery within approximately 50 feet of a vernal pool during mud season. Ruts deeper than 6 inches can disrupt migration routes of endangered salamanders. There should be no ruts deeper than 6 inches within 200 feet of a vernal pool. Similarly, the actual vernal pool depression should not be physically altered so that its ability to seasonally hold water is impaired.

4. Tree tops or slash should not be allowed to fall or be placed into vernal pool depressions. While many amphibians use downed woody material to attach their eggs to, no additional material should be added to a pool. If tops or branches do fall into a depression, they should be removed. Similarly, existing natural woody material should NOT be removed from vernal pool depressions.

5. It is important that the temperature and relative humidity at the soil surface be maintained in the cool, moist condition necessary for amphibians that use vernal pools. Thus, it is important that these vernal pools, and an area within 50 feet of these pools, be maintained in a shaded and mostly undisturbed condition.

   a. Do not clearcut these areas. Some forest cover must be maintained to provide continuous shade and protection from high temperatures at the soil surface. Do not leave only trees with small or damaged tops, or those that appear to be dead or dying. Established understory vegetation such as mountain laurel, hemlock, or naturally established advanced regeneration can provide shade. Similarly, shade can be provided by vigorous hardwood sprouting following a harvest.

   b. Avoid disturbance of the mineral soil within 50 feet of a vernal pool depression for several reasons. First, it is important that sediment not accumulate in vernal pool depressions. Second, the exposure of mineral soil removes the natural insulation provided by the accumulated litter on the forest floor. This litter can be several inches thick and can keep actual soil moisture and temperature from getting too high, even if exposed to direct sunlight. For these reasons, it would be best to operate in the vicinity of vernal pool depressions when the ground is frozen and covered with snow. Under other dry conditions, it would be advisable to not operate machinery within 50 feet of a pool depression, and to winch timber (if any is cut within this radius) out of this area. Finally, it would be advisable not to operate within 50 feet of a vernal pool depression during mud season, so as to not create ruts.

5/94

Partially funded by a grant from DEM Forest Stewardship Program